APRIL'14 ISSUE

# PARTICLE POST

COLLIDER-ACCELERATOR DEPARTMENT

Contact: C. Scholl

PREVIOUS ISSUES
March 2014 GO



**A WORD FROM THE:**

Administration
Accelerator Div.
ES&F Div.
Acc. R&D Div.
Operations

Arrivals/Departures

Safety Stats

Quote of the Month: "Science does not know its debt to imagination" - Ralph Waldo Emerson

## NOTE FROM OUR CHAIR: Thomas Roser

RHIC is operating for the the first time with gold-gold collisions and the full 3-D stochastic cooling (longitudinal, horizontal and vertical) system in both rings and the results are spectacular. As we first saw in uranium-uranium collision a couple of years ago the luminosity starts to rise just 15 minutes into a store when the stochastic cooling overcomes the Intra-Beam Scattering that would otherwise blow-up the gold beams. The luminosity continues to rise for about 2 hours exceeding the initial luminosity. At that point the luminosity starts to drop because the gold ions are used up by the collisions in STAR and PHENIX.

RHIC is the only hadron collider that has ever achieved this performance. As a result of the RHIC stochastic cooling and also the record gold intensities from the EBIS pre-injector and the AGS and Booster, STAR and PHENIX are collecting data at a faster rate than planned. If this level of performance continues we may be able to complete the gold-gold run early and switch for the last few weeks to a new mode of operation for RHIC: colliding helium-3 beams with gold beams.

There is also good news to report for the Accelerator Test Facility (ATF). The upgrade proposal for the facility, ATF II, has been approved by DOE HEP This means that we will start to set-up an electron source and accelerating structures in building 912 as the first step to move the ATF operations from the cramped quarters of building 820 to the much larger building 912. The approval of the ATF II upgrade also triggered the start of the lab funded development of a world-leading 100 TW CO2 laser system

## DID YOU KNOW??

***Check out who received an employee Service Award this year!*** 2014 Collider-Accelerator Dept. employees who received a *Service Awards.* Last yeas Service Awards are listed *here*. 2012 Service Awards are listed *here*.

***In Memoriam of John De Boer -*** As you have heard, John unfortunately passed away last December at 61 years old, William Safer wrote a nice Article about John *here..*

***Congratulations Ming Ke (C-AD) & her Husband Chenghao Yu (PS) who had their second child! ~*** They had a 9 pound baby boy March 20, in which they named Ethan.. Below are pictures of them with Ethan and their daughter Emma..

## EVENTS/SEMINARS...

Check out the *BNL Calendar* for upcoming events & Seminars or the *Upcoming Conferences & Workshops* page for workshops and Conferences happening at BNL.

April 8 - (Bldg. 510 - LSR | 3:30) Physics Colloquium, "Mr. Particle Physicist Goes to Washington: HEP User Community Government Relations in the Context of P5" Presented by Breese Quinn, U. of Mississippi

April 9 & 10 - (Berkner Hall B | 12pm) Brookhaven Women in Science

***Steve Bellavia Built a small telescope ~***
*See pictures and video* of the satellite dish Steve built with under $20 in parts!

***Look who made it to Northforker 50+ Article in the paper!*** *Bill Taylor* was an AGS Operator years ago and good friends as well as partner in the Main Control Room with P. Sparrow.

(BWIS) Event

April 10 - (Berkner Hall B | 6:30pm) Community Advisory Council Meeting

April 14 - 18 (Research Library Bldg 477 | 10am & 2pm) National Library Week Events

April 14 - (Bldg 734 | 11am) Myron Strongin Seminar "Search For Superconductivity in the Mn-based Pnictide LaMnPO" Presented by Daniel McNally, SBU

April 15 - (Bldg 510 - LSR | 3:30) Physics Colloquium "The proton-neutron interaction and the emergence of collectivity in the structure of atomic nuclei" Presented by: Richard F. Casten, Yale Tranquada

April 16 - (Bldg 510 - SSR | 2pm) High Energy Physics & RIKEN Theory Seminar

April 16 - (Bldg 510 - LSR | 3:30) Physics Colloquium "TBA" Presented by Matias Zaldarriaga, Institute for Advanced Study

April 17 - (Bldg 510 rm 2-160 | 12:30pm) RIKEN/BNL Lunch Time Talk

April 17 - (Bldg 510 - SSR | 3pm) Particle Physics Seminar " First Data & Prospects for DM-Ice" Presented by Reina Maruyama, Yale

April 18 - (Bldg 510 -SSR | 2pm) Nuclear Physics & RIKEN Theory Seminar

April 22 - (Bldg 510 - LSR | 3:30pm) Physics Colloquium "Prospects for the physics of cold, sparse hadrons" Presented by Craig Roberts, ANL

April 23 - (Berkner Hall B | 12pm) Home Ownership & Financing

April 24 - (Bldg 510 rm 2-160) RIKEN/BNL Lunch Time Talk

April 24 - (Bldg 510 - SSR | 3pm) Particle Physics Seminar "Latest results on SUSY searches from CMS" Presented by Eva Halkiadakis, Rutgers U.

April 29 - (Bldg 510 - SSR | 11am) Nuclear Physics Seminar

April 29 - (Bldg 510 - LSR | 3:30pm) Physics Colloquium "Redrawing the boundary between classical and quantum mechanics" Presented by Mishkatul Bhattacharya, Rochester Institue of Technology

***SBU program Women in Science and Technology*** - On March 1 and March 8 the Collider-Accelerator Department hosted several groups of female undergraduate students from SBU (WSE, http://www.wise.sunysb.edu/ ). S. Verdu Andres hosted 6 young science students and, together with Zeynep Altinbas, Carlos Marques, Prerana Kankiya, Toby Miller, Omer Rahman, Mona Rowe, Tianmu Xin and Qiong Wu, we introduced the world of particle accelerators to the students.

***Do you have to give a talk?***

**Public Speaking Techniques:**

**Verbal & Non-verbal**

***Presented by:***

***Theodore Sampieri Ext: 4894***

***12:00 – 1:00 Fridays***

CAD Building 911

*Large Conference Room: 2nd Floor*

## IN OTHER NEWS...

***Mom's harness invention gives kids a chance to walk ~*** *Read about it .. The standing harness allows wheelchair-bound kids to walk o even dance.*

***First-Ever Asteroid with Rings knock Astronomers for a Loop~*** When Astronomers got a rare look at an asteroid passing in front of a distant star last year, they discovered something rarer still: the first asteroid with rings .. Read More..

## WHAT'S GOING ON IN OUR NEIGHBORHOOD?

***Interested in Cycling?*** No Cycling Events at this time

***Interested in Running or Walking?*** Check out the lirunning March Calendar for the following events: Sarcoidosis Awareness 5k (Centereach); LIRR Easter Bunny 5k (Eisenhower Park) & more..

***For the Kids*** Non at this time @ The Nassau Coliseum.

## DAY AT THE VINEYARDS...

***Macari Vineyard*** ~ [MATTITUCK] March 8 ~ Ray Anderson Band; March 29 ~ Barrel Tasting & food tasting with the frisky oyseter

***Duckwalk North*** ~ [SOUTHOLD] No Events Posted
***Duckwalk South*** ~ [WATER MILL] March 8 ~ Live Music; March 22 St Patrick's Day Dinner

***Castello di Borghese Vineyard & Winery*** ~ [CUTCHOGUE] ** Vineyard Tours & Wine Tastings Every Thursday & Sunday @1pm & FREE Jazz Every Saturday (2~4) with Marguerite Volonts**

***Stony Brook Events:***
***Ticks/Lyme Disease:*** April 10 (6:30pm~) Presentation abotu Lyme Disease and Buffet Dinner ~ 25$ pp

***Spring Appreciation Day*** ~ April 26 (12~5pm) Join us for a day of fun for the whole family in celebration of spring at our annual Spring Appreciation Day. The afternoon will feature a petting zoo, a magician, Walkie Bear and WALK radio, special one~day sales at our retailers and a free art show at the Educational & Cultural Center. There will also be horse~drawn carriage rides available for $3 per person..

***The Red Skelton key!*** ~ May 3 ~ June 14 (11:30am~)Popular Musical and high tea luncheon

***Nassau Coliseum ~***
***Upcoming shows:*** Miley Cysrus & Sonu Nigam

May 2, 3 & 4 ~ United Ink Summer Vibe Tattoo Festival

May 31 ~ The Greater NY Pet Expo

***Check out Erik Forsyth's Travel's***:

HTTP://WWW.YACHTFIONA.COM

***Jamesport Vineyards*** ~ Feb 8th-Mar 16th: Live on the Vine (Acts and times TBA)

***Martha Clara Vineyards*** - [RIVERHEAD] ~ **Live Music every weekend**

***Palmer Vineyards*** - [RIVERHEAD] APRIL 6 ~ Paint & Sip

***Pindar Vineyards*** - [PECONIC] ~ No Events Posted

***Baiting Hollow Farm Vineyard*** ~ [CALVERTON] *Music every Sat & Sun from (2~6)*

***Paumanok Vineyards*** ~ [AQUEBOGUE] No Events Posted
August 5~15, 2014 ~ Paumanok Mediterranean Wine Cruise

## NOTE FROM OUR ADMINISTRATION: S. LaMontagne

Although you are more apt than not to hear me complaining about funding cuts and delays, runaway cost for overtime or increases in power rates, the overall financial pictures for FY 2014 is truly a positive one. As a Department, we anticipate $157M in new funding this year, a $5M increase over last year. The RHIC operating budget received its first inflationary increase since 2010 and while funds are constrained, it is, in all likelihood, a reflection of an ambitious work scope. C-AD staff is very motivated, engaged and consistently generates more ideas for the future of the facility than we could possibly fund or accomplish.

Our mission, too, has grown over the past few years. In FY 2011, very shortly after the Isotope Research and Production Program was transferred to the Nuclear Physics Program Office in DOE's Office of Science, the Isotope Program at BNL was transferred from the Medical Department to C-AD. The NP Program Office is working with us to revitalize the research component of the program and funding for R&D reflects that goal. C-AD has also received accelerator improvement funding for upgrades at the LINAC to benefit both the Isotope and RHIC programs.

The Accelerator Test Facility (ATF) and Muon Acceleration Groups are also new to C-AD. Both groups were transferred from BNL's Physics Department to C-AD in April 2013. Although funded by DOE's Office of High Energy Physics, there is a beneficial synergy with our mission. C-AD personnel have worked with staff at the ATF to propose an upgrade to the ATF facility which will moved from its present location in Building 820 to Building 912. We learned last month that the first funds for the upgrade will arrive in May.

In conclusion, I remain grateful for the opportunity to work in such a dynamic environment. Keep up the good work, be safe and spend wisely.

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## NOTE FROM OUR ACCELERATOR DIVISION: Wolfram Fischer

The last month saw the first operational use of the Laser Ion Source (LION) at EBIS. LION is an innovative new source that allows for rapid switching between a large number of different ions, greatly enhancing our capabilities for the NSRL and RHIC programs. Congratulations to Masahiro Okamura, Takeshi Kanesue and the whole team, who made this possible.

In RHIC physics operation at the highest energy began on 15 March 2014 after only 4 days of setup, and we are presently ahead of even the optimistic luminosity projections. A number of improvements made this possible. EBIS now runs very reliably, and the new low-level rf system in the Booster allowed for better bunch merges. This produces gold bunches of record intensities the AGS extraction. In the past we could not accelerate such intense bunches in RHIC, but changes in the so-called Landau cavities provide better stability during transition crossing, when longitudinal focusing is lost for a brief period. We also benefit from the long polarized proton run last year with record intensities. The high intensities "scrubbed" the beam pipe surfaces which otherwise multiply electrons that are lost, forming electron clouds that make the beam unstable. All of this leads to new record peak luminosities, 25% higher than in the last Au+Au run.

But this is not yet all. This is the first Au+Au run with full 3D stochastic cooling, and a new longitudinal cooling system. The cooling system handles the higher intensity well, and the performance is so good that we have stores 10 h long, comparable to proton stores. Best of all, the average store luminosity is now 35% higher than previously, even with the very long stores.

More improvements may come soon. The Run Coordinator Guillaume Robert-Demolaize is preparing a further reduction of the beam size at the interaction point after beams are cooled to their smallest sizes – this would be the first beta-squeeze during stores in RHIC. And the new 56 MHz superconducting rf cavity is now cooled to 4K, and commissioning progresses further.

Through the outstanding efforts of Booster/AGS PS Group we also have the Siemens Motor-Generator back in operation, after a tricky problem in the controls of that device was resolved.

## NOTE FROM OUR EXPERIMENTAL SUPPORT & FACILITIES DIVISION: Phil Pile

We have now made the transition from low energy gold beam collisions to 200 x 200 MeV gold beam collisions. The first physics store came on 15 March, just 4 days after we ended the low energy run. Stochastic cooling for the gold beams is working up to expectations and with this and good EBIS performance together with bunch merging, the experiments are enjoying record luminosities with the delivered integrated luminosity tracking well above our maximum projections. The 56 MHz cavity is still to be commissioned, and if successful will enable more of the RHIC luminosity to be within the experiment vertex detector acceptance. Heavy quark is the focus for both PHENIX and STAR and we are on track to nail this physics.

BLIP has been running well with good beam conditions, primarily using rubidium chloride targets for production of the medical isotope strontium-82. Next week we plan to expose another (second one this year) thorium target to beam for shipment to ORNL for processing. Another short thorium irradiation is planned for early May. The medical isotope of interest for these irradiations in actinium-225. Nick Simos' LHC R&D targets were exposed for another ~2 week period…we still owe him another week with beam later in the run. These special runs for Nick do have a negative impact on strontium production so we plan the runs for minimal impact to strontium production. On 21 April we plan an R&D run to empirically determine the optimum BLIP beam energy degrader for production of the medical isotope yttrium-86 (a PET isotope). This will require a 66 MeV LINAC beam so will be a dedicated run. The runs are, however, of short duration so the impact on strontium production will be minimal.

The NSRL facility began operations for run 14A this past month. The experiments began on 25 March with a week of running in support of the National Reconnaissance Office (NRO). The usual NASA radiobiology experiments are presently running and will continue through 16 May. The next run will follow shortly after 16 May and continue until near the end of June.

## NOTE FROM OPERATIONS: Paul Sampson

RHIC Run 14 continues quite successfully. The scheduled low energy run was completed last month, with all major Physics goals reached. The transition to High energy, run by Operations, went very smoothly.

The High energy Au-Au run began mid-February and will continue for ~15 weeks. Recent major strides include, setup and commission of 3-plane stochastic cooling, increased intensity and reduced (normal) turnover time. As a result, the store lengths have increased allowing for development, maintenance and repair in the AGS.

On Maintenance Days, installation and commissioning of major systems continues, with focus on the 56MHz cavity, CeC and Stochastic cooling. Presently, the 56MHz cavity is cold (4k) and final preparation work is being performed. Initial tests and conditioning will follow later this month.

Work in the AGS also continues, including preparation for polarized protons with the installation of e-IPMs and A20 cold snake startup. The Main Magnet power supply was reverted back to use of the Siemens motor Generator after repair of the Cyclo-converter was completed. This was done behind a store and did not impact RHIC Operation.

BLIP continues to run well. Maintenance for BLIP and LINAC continues to run independently from the rest of C-AD. It is synchronized with scheduled BLIP target changes. LINAC will run Polarized Protons for setup in the Booster and AGS this month, which may change scheduling to optimize this effort.

In the pre-injectors, improvements to EBIS and progress with the laser ion source continue. First beams from the laser ion source were run through EBIS, injected into, accelerated and extracted from the Booster. Species extracted to the NSRL experimental hall included Iron, Gold and Tantalum. The scheduled NRO run was completed early in the month and NSRL Run 14A has begun. Setup to run NSRL with polarized beam from the LINAC will take place during the week of April 7th.

The CAD CATV system display includes daily updates including Testing, power disruptions and outages as well as important dates. This information can also be seen on the web at RHIC Broadcast.

To view a list of the approved work for shutdown or maintenance, go the Job Request System and select the appropriate date. This link is behind the firewall and requires privileges to view.

For schedule updates see: This Week, which can be viewed by all.

## NOTE FROM ACCELERATOR R&D DIVISION: Ilan Ben-Zvi

eRHIC design:

The FFAG eRHIC design was successfully presented at the first accelerator Workshop on Electron-Ion Colliders, EIC'14, which took place in Jefferson Lab on March 17-21. Practically all aspects of the eRHIC accelerator design were covered in total of 27 talks. Discussions with accelerator experts at the Workshop generally confirmed the feasibility of the FFAG design approach and emphasized again the importance of upcoming eRHIC R&D activities. The question that we may need to answer in the following few months is: how much is actual cost saving due to employing the FFAG lattice technique? Present eRHIC design activity continues with an accent on the permanent magnet design, energy loss and spread compensation techniques and several beam dynamics aspects.

LARP Group:

The Proof of Principle version of the Double Quarter Wave Cavity has finished its last experiment at BNL, which was the bead-pulling measurement. We successfully located all the resonance modes below 2 GHz, and created a 3D field map within a 30 mm diameter cylindrical volume along the beam axis. The cavity is preparing for the next round of chemistry cleaning and will be shipped to CERN for future measurements. The prototype cavity for SPS has finished its final design and will be released for fabrication within a week. An external technical review on LHC crab cavity program will be held at BNL in early May, just before the LARP collaboration meeting.

The ATF:

In March the ATF supported the USA-Japan collaborative user experiment on nonlinear inverse Compton scattering. New results have been obtained on interacting a circular-polarized, 1-TW, CO2 laser with a counter-propagating electron beam. This adds to the understanding of the mass shift effect in the Compton x-ray spectrum due to the relativistic electron oscillations in a strong laser field.

Notably, this was the first experiment where the ATF $CO_2$ laser was operated in a new configuration based on optical parametric generation of a femtosecond 10-micron seed pulse by a Ti:sapphire laser. This move marks a significant step in progressing to much higher laser powers anticipated by the ATF's 3-year upgrade plan.

Low Energy RHIC electron Cooling:

Preliminary Accelerator physics design for LEReC based on existing ERL's 704 MHz SRF gun and 5-cell SRF cavity was established. Beam dynamics simulations were performed to identify additional beam components, which are needed to achieve beam parameters required for electron cooling. Required additional hardware and specs (such as energy corrections cavities, magnet chicanes and mergers) and their design issues are under discussion.

The layout of LEReC components in the RHIC tunnel is making progress. Work started on a new WBS for the present LEReC baseline, with a detailed cost estimate to be done in April.

ERL:

The Internal Readiness Review (IRR) took place on April 3-4. This review is in preparation for the Accelerator Readiness Review (ARR), which will take place this summer. The IRR team was charged by C-AD Management to: Provide an independent evaluation of the ERL's Readiness Review Process; identify additional actions needed for a successful Accelerator Readiness Review (ARR); and identify actions (recommendations) that would enhance the ERL Readiness Review Process.

The team members were Chuck Schaefer (lead), Jessie Wilke, Walt Czekaj, Peter Ingrassia, Asher Etkin, Charlie Theisen and Pat Sullivan. Many C-AD people besides those on the review team participated on the side of being reviewed. The review was extremely useful and provides us with a list of action items that will make the ARR much easier.

SRF:

56 MHz SRF cavity for RHIC: The cavity was filled with liquid helium last week. It is now superconducting. The LLRF system is installed and has begun taking data. All motion system are commissioned although there are still some controls issue to be fixed. The plan is to start conditioning the cavity within a week or two.

SRF for CeC PoP: The fundamental power system of the 112 MHz SRF gun and laser cross are installed. Welding of its cryogenic lines is in progress. The baking of the cathode launcher was completed.

SRF VTF: The BNL3-1 cavity, fabricated by AES, was successfully tested at the LVTF. There was some radiation inside the radiation shielding due to field emission in the cavity. No significant radiation was registered around the blockhouse thanks to installation of additional lead shielding covering cracks between the shielding blocks. The cavity reached 17.1 MV/m in CW and 19.7 MV/m in pulsed mode. We could not proceed further due to RGD limits for this facility. As we don not observe any significant radiation outside the block house, the plan is to request increasing the RGD limits.

This was our first successful test at 2 K at LVTF. Congratulations to everybody involved! The second BNL3 cavity (fabricated by Niowave) is being prepared for the vertical test in two weeks.

Muon Accelerator Group:

The design of the BNL proposed 6D-cooling channel for eventual deployment in a Muon Collider complex has progressed. Special attention has been given to engineering constraints as well as component simplification. Although liquid hydrogen (LH2) remains the superior material of choice for the required wedge absorbers, new solutions have been found in which simpler wedges formed from solid Lithium Hydride (LiH) have been determined. This has the distinct advantage of avoiding the design and fabrication of liquid hydrogen wedges. Further design improvements are being pursued

## ARRIVALS: Welcome!

Lionel Desulme - Started at C-AD as Principle Technician Electrical in the Collider-Accelerator Support Group on March 17, 2014.

## DEPARTURES: Farewell, you will surely be missed..

Joel Vasquez - (Access Controls) - Last Day was March 31, 2014

***Guest Notices:***

M. Schaumann - CAD Guest Last day was Mar. 28, 2014
J. Tamura - Last day was March 27, 2014

David Bruhwiler (Q6199), Remote User, expiration date May 13, 2014

Xinyi Xie (V8533), Guest Research Assistant, expiration date May 24, 2014

Thomas Schultheiss (X6798), Admin – Other, expiration date May 31, 2014

## SAFETY STATS: Peter Cirnigliaro - **Please check back for updated version**

## PHOTOS BY: STEVE BELLAVIA

Steve built a small radio telescope, from an old satellite dish and under $20 in parts.  He used it to "listen" to the sun on Saturday. See the Video here..